



UNITED STATES DEPARTMENT OF COMMERCE
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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.
09/387,164	08/31/99	HU	303.607US1

MM91/1024
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EXAMINER

ROY, S

ART UNIT

PAPER NUMBER

2879

DATE MAILED: 10/24/01

Please find below and/or attached an Office communication concerning this application or proceeding.

Commissioner of Patents and Trademarks

Office Action Summary	Application No. 09/387,164	Applicant(s) HU, YONGJUN	
	Examiner Sikha Roy	Art Unit 2879	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 31 August 1999.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☐ Claim(s) _____ is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-36 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☒ Claim(s) 37-85 are subject to restriction and/or election requirement.

Application Papers

- 9) ☒ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on _____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
* See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) Paper No(s). _____ |
| 2) <input checked="" type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO-1449) Paper No(s) <u>4</u> . | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Election/Restrictions

Restriction to one of the following inventions is required under 35 U.S.C. 121:

- I. Claims 1-36 drawn to, field emitter display device classified in class 313, subclass 309.
- II. Claims 37-85, drawn to method for making the emitter device with layer enhancing emission of electrons, classified in class 445, subclass 24.

Inventions of Group I and Group II are related as product and process of making it. The inventions are distinct if either or both of the following can be shown: (1) that the process as claimed can be used to make other and materially different product or (2) that the product as claimed can be made by another and materially different process (MPEP § 806.05(f)). In the instant case, the product as claimed can be made by another and materially different process. For example, the product as claimed, can be made as follows: forming the layer with different dose of oxygen ions (10^{18} atoms/cm²), annealing with nitrogen at a temperature higher than 1000 degrees Celsius.

Because these inventions are distinct for the reasons given above and have acquired a separate status in the art as shown by their different classification, restriction for examination purposes as indicated is proper.

During a telephone conversation with Mr. Daniel Kluth on 10/10/01 a provisional election was made without traverse to prosecute the invention of group I, claims 1-36.

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Affirmation of this election must be made by applicant in replying to this Office action.

Claims 24-25 are withdrawn from further consideration by the examiner, 37 CFR 1.142(b), as being drawn to a non-elected invention.

Applicant is reminded that upon the cancellation of claims to a non-elected invention, the inventorship must be amended in compliance with 37 CFR 1.48(b) if one or more of the currently named inventors is no longer an inventor of at least one claim remaining in the application. Any amendment of inventorship must be accompanied by a petition under 37 CFR 1.48(b) and by the fee required under 37 CFR 1.17(i).

Drawings

The drawings filed on the application are acceptable subject to corrections of the informalities indicated on the attached "Notice of Draftperson's Patent Drawing Review", PTO-948.

Specification

The title of the invention is not descriptive. A new title is required that is clearly indicative of the invention to which the claims are directed.

The following title is suggested:

FIELD EMITTER DEVICES WITH EMITTERS HAVING IMPLANTED OXIDE
LAYER FOR ENHANCEMENT OF ELECTRON EMISSION

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

Claims 1-3, 5,7,9,11,13 -26,33 - 35 are rejected under 35 U.S.C. 102(b) as being anticipated by U. S. Patent 5,372,973 to Doan et al.

Doan et al. disclose (column 3 lines 5-15, column 6 lines34-37) a field emission display device with conical micro-cathode, the emitter tip 13 being coated with a low work function material SiO₂. It is further noted (column 6 lines51-53) that this coating on the emitter results in an emitter tip that may not only be sharper than a plain silicon tip, but also has greater resistance to erosion and a lower work function. The limitation pertaining to the oxide layer being implanted is a method of manufacturing the layer and hence patentable weight is not given. The scopes of the claims referring to implanted layer inhibiting outgassing including moisture, lowering the potential barrier, affecting the image force and enhancing the Schottky effect so as to enhance the release of electrons being functional, no patentable weight is given.

Referring to claims 14, 16, 18, 20, 22, 25, 27-32 Doans et al. disclose the SiO₂ layer being embedded (coated) in the surface of the emitter.

Referring to claims 33-35, Doans et al. (column 3 lines 18, 19 Fig. 1) field emission device comprising substrate 11, conical micro-cathode 13, the tip being coated with a low work function material releasing stream of electrons 17 emitted toward a phosphor coated screen 16.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 4, 6, 8, 10, 12 and 36 are rejected under 35 U.S.C. 103(a) as being unpatentable over U. S. Patent 5,372,973 to Doan et al.

Doans et al. do not disclose the oxide layer underneath the surface of the emitter. It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the oxide layer formed underneath the surface, since it has been held that rearranging parts of an invention involves only routine skill in the art. *In re Japikse*, 86 USPQ 70.

Referring to claim 36, Doan et al. disclose (column 1 lines 27-32) the use of a matrix-addressable array of cold cathode emission devices to excite phosphor on a screen of a flat panel display. Doan et al. further teach that narrow cathode-to-gate spacing and sharp tips with low work function material coating yield greater current with lowered threshold voltage. Therefore it would have been obvious to one of ordinary skill

in the art at the time of invention to modify the use of these field emission devices with a display screen in a video display for high brightness and uniformity of illuminated pixels.

Claims 27-32 are rejected under 35 U.S.C. 103(a) as being unpatentable over U. S. Patent 5,372,973 to Doan et al. and further in view of U. S. Patent 5,817,201 to Greschner et al.

Greschner et al. in analogous art of fabricating a field emission device disclose (column 3 lines 50-66, Fig. 2) the tip comprising a body 9 of a first material forming the series resistor and a coating 7 of a second material with low work function allowing high emission efficiency at relatively low voltages. The tip body 9 can be made of a dielectric material which is covered with a resistive layer. The tip-individual series resistor offers higher tip to tip homogeneity of electron emission since there is no voltage drop within a group of tips which provides the advantage of low supply voltage (column 3 lines 37-41). It is further noted (column 4 lines 5-15) that the use of silicon for the high resistivity material is advantageous because the resistivity of silicon can be easily modified and silicon can be deposited by using standard depositing techniques.

Therefore it would have been obvious to one having ordinary skill in the art at the time of invention to modify the embedded layer on the tip of low work function material of Doans et al. with a coating of resistive silicon as taught by Greschner et al. which provides the advantage of easy deposition and high field emission efficiency at lower voltages.

Conclusion

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. The following patents are cited to further show the state of the art with respect to fabrication of electron field emitters.

U. S. Patent No. 5,993,281 to Musket.

U. S. Patent No. 6,017,257 to Potter.

U. S. Patent No. 6,069,018 to Song et al.

U. S. Patent No. 6,124,670 to Valone


JP 2000090811 to Agency of Ind. Sci. & Technology.


Contact Information

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Sikha Roy whose telephone number is (703) 308-2826. The examiner can normally be reached on Monday-Friday 8:00 a.m. – 4:30 p.m.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Nimeshkumar D. Patel can be reached on (703) 305-4794. The fax phone number for the organization is (703) 308-7382.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-0956.


Sikha Roy
Patent Examiner
Art Unit 2879


NIMESHKUMAR D. PATEL
SUPERVISORY PATENT EXAMINER
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